DOCUMENT RESUME

ED 159 632 CS 004 364

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TITLE Semantic Constructivity in Children's Comprehension.
PUB DATE 78
NOTE 16p.; Research prepared at National College of Education

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Deep Structure; Elementary Education; Higher Education; *Language Development; *Linguistic Theory; Psycholinguistics; Readability; *Reading Comprehension; *Reading Processes; *Reading Research; *Semantics; Silent Reading

ABSTRACT

To ascertain whether subjects spanning the range of reading acquisition exhibit semantic constructivity when confronted with a silent reading task, a study was conducted involving 120 second, fifth, and seventh graders, and 30 graduate students. For purposes of the study, semantic constructivity was defined as the uncued production of inferences based on one's knowledge of spatial relationships and reflecting semantic descriptions located in separate statements in a text. The subjects were tested using an "acquisition/false recognition" paradigm comparing their recognition memory for sentences with identical deep structure but which differed in the semantic descriptions suggested. The primary result was the strong tendency for all subjects to "recognize" the semantically congruent inferences present in the recognition task as having been present in the original acquisition situation. The findings support the psycholinguistic studies of miscues in oral reading which characterize reading as a constructive rather than an interpretive process. These findings imply that further research should be toward a reconsideration of theories and questions of readability. Additional research might consider the type of constructive activity that readers of differing ages exhibit. However, the strongest implication is support for the reemphasis of reading as a language-based process. (Author/FL)

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Semantic Constructivity in Children's Comprehension

Camille L.Z. Blachowicz

Introduction

A substantial body of research in reading reflects the influence of the growth of linguistic theory as well as advances in developmental and experimental psycholinguistics. Because of the orientation of these related disciplines, the sentence has been regarded as the critical linguistic unit in many studies of reading comprehension (Bormuth et al, 1970; Pearson, 1974-75). This genre of study has accepted a major assumption of transformational grammar, that the comprehension of a sentence involves reaching its deep structure which is sufficient to characterize the information acquired and retained by the reader (Clark, 1969). Within this frame of reference, comprehension becomes primarily an interpretive function with the reader viewed as interpreter.

Current investigations in psycholinguistics, however, suggest a shift towards a more constructive view of comprehension. In many different experiments, it has been demonstrated that it is the semantic, not the syntactic, content which is retained (Bransford et al, 1972; Sachs, 1967). Such studies of comprehension characterize the comprehender as actively involved in constructing semantic descriptions of situations from linguistic input and assimilating them into his theory of the world. A significant aspect of such studies is that the resulting semantic product, or construct, embodies more information than was available from the separable units of linguistic input. Therefore, besides suggesting that the comprehender constructs rather than interprets, these studies imply that the critical unit of comprehension is much larger than the sentence alone. Thus, textual, rather than sentential, analysis appears to be on the cutting edge of linguistic and psycholinguistic theory and experimentation (Freedle and Carroll, 1972).

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The parallels between this theory of semantic constructivity and the "psycholinguistic model" of the reading process espoused by Goodman and others (Goodman, 1968) are striking and obvious. The "sample-predict-test-confirm" process is based on a comparison of input data with the existing knowledge structures of the reader and the assimilation of input, when a prediction is confirmed, or, lacking such confirmation, with accomodation of the knowledge structures. To date this constructive view of the reading process has found empirical support primarily in the many miscue studies following Goodman's model (Goodman and Burke, 1973). However, such studies involve oral reading done at the subject's frustration level, being thus removed from silent reading at a more comfortable level that characterizes "ordinary" reading.

In their examination of unexpected responses to cues from the text, these miscue analyses are the real-world analogue of the false-recognition paradigms currently being utilized in psycholinguistic studies. In these latter experiments, the experimenter presents the subjects with a variety of sentences from which both "cued" and "miscued" inferences can be drawn. It is the systematic nature of the false inferences that provides information about the strategies being utilized by the comprehender in these silent reading tasks, much as analyses of oral data in pupil strategies in the miscue studies.

For example, Bransford et al (1972) provided the following sentences:

Acquisition 1- Three turtles rested beside a floating log and a fish swam beneath them.

Acquisition 2- Three turtles rested on a floating log and a fish swam beneath them.

Recognition- Three turtles rested (beside/on) a floating log and a fish swam beneath it.

Subjects heard either acquisition sentence 1 or 2 and were later asked whether or not the recognition sentence had occured. The constructive view of the comprehension process predicts that the subjects who had heard acquisition sentence 2 would be more likely to falsely recognize the third sentence as having been read previously since it is semantically congruent with their input sentence. Interpretive views would predict no difference in "miscuing" since the linguistic change, the substitution of the pronoun "it" for "them," would be the same in both cases. The constructive approach was confirmed by this and further experimentation in which temporal, causal and instrumental inferences were drawn as well as those of a spatial nature (Harris and Brewer, 1973; Bransford and Johnson, 1972).

The Study

Despite the Piagetian overtones of such studies of semantic constructivity, to date they have been done primarily with adult subjects. Also, in spite of the theoretical analogy to the psycholinguistic model of reading, the studies have been carried out with auditory input. The present study was designed to ascertain whether subjects spanning the range of reading acquisition exhibit semantic constructivity when confronted with a silent reading stimulus. Semantic constructivity was here defined, in a very limited sense, as the uncued production of inferences based on one's knowledge of spacial relationships and reflecting semantic descriptions located in separate statements in a paragraph. This was investigated by comparing recognition memory for sentences with identical deep structures but which differ in the semantic descriptions suggested.

The Subjects

The subjects were 40 children (CA 7-1 to 7-8) from the second grade, 40 children (CA 10-1 to 10-11) from the fifth grade, 40 children (CA 12-2 to 12-10) from the seventh grade and 30 adults enrolled in a graduate program in education. The school-age subjects were randomly drawn from a pool of approximately 120 at each grade level with the provision that an equal number of males and females be chosen. The school from which the sample was taken was located in a white, middle-class neighborhood. The college students attended a large, midwestern university. No IQ data were available on the subjects, but the cumulative range of the school age subjects on the Iowa Test of Cognitive Abilities was stanines 2-8.

The Materials

The materials consisted of the acquisition set and the comprehension set of sentences which were drawn from a corpus of words representative of second grade reading materials (Harris and Jacobson, 1972). The acquisition set consisted of ten paragraphs of which the first and the last were primacy and recency buffers. All stories conformed to the format:

A relation B
B relation C
A equivalence or attribute

For example:

The birds sat on the branch.
A hawk flew over it.
The birds were robins.

The order of the eight stimulus paragraphs was randomized so that

no packet order was discernible. The order of the three component relation types was randomized within each paragraph so that a relational pattern was not evident.

The recognition set was composed of forty sentences, four related to each acquisition paragraph, therefore totalling eight buffer sentences and thirty-two recognition items. The format for the four items for each stimulus paragraph were:

a true statement (TS)

a false statement (FS)

a true inference (TI)

a false inference (FI)

For example, for the sample paragraph given above:

The birds sat on the branch. (TS)

A hawk flew under it. (FS)

A hawk flew under the birds. (FI)

A hawk flew over the birds. (TI)

Procedure

Acquisition: Subjects were tested in groups of ten. They were instructed,"Please read the following paragraphs carefully so that you will understand and remember them. Later you'll be asked questions about them. You will have three minutes to read, If you finish, you may go back and reread so that you will understand and remember them."

After three minutes, the paragraphs were collected and a five minute interpolated task performed.

Recognition: After the five minute interval, the subjects were given the recognition packet. They were instructed to read the directions silently while the experimenter read them aloud," If you saw the sentence in the stories you read, mark YES in front of it. If you did not see it, mark NO. Mark YES only for those

sentences that are exactly the same as the ones you read. If a sentence appears twice, mark it twice." In actuality, none appeared twice but the direction was given in anticipation of the subjects misequating two sentences.

A sample sentence was marked on an overhead projection and all the subjects indicated that they understood the task. No questions were taken once the sample had been completed. After 15 minutes, the recognition task was collected, all subjects having completed within the time limit.

Results

Examination of the data gathered on the miscued inferences exhibited on the recognition test indicated an overall pattern of performance which strongly supports the constructive hypothesis. While an overall analysis of variance (Total Misrecognitions X Age Group) indicated a difference in the magnitude of misrecognition among the age groups ($F_{3,146} = 22.8$, $p < .001$), with the younger children making significantly more errors (See Table 1), analysis of the miscue profile was more enlightening.

An examination of error type by group (TI, TS, FI, FS X Group) was performed and the results for each error type recapitulated the results for the total errors, the youngest and oldest subjects comprising the extremes of performance with the middle groups responding in a fairly homogeneous manner. However, the significance level of the difference among the groups was lowest when the TI factor was the dimension along which they being compared ($F_{3, 146} = 3.087$, $p < .003$) whereas the other F ratios were significant at the .001 level.

Most interesting was the breakdown of the total error count when comparing group means. a remarkable similarity in the pattern of errors emerged (See figure 1). Each group committed

Analysis of Variance- (Errors X Group)

Scheffé's Post-Hoc Comparison

Homogeneous subsets

Subset 1

Group	Group 3 - 11 year olds	Group 2- 9 year olds
Mean errors	9.0750	9.150

Subset 2

Group	Group 4- adults
Mean errors	5.567

Subset 3

Group	Group 1 - 7 year olds
Mean errors	12.10

Table 1

Comparison of Sentence Type Errors for
Each of Fours Age Groups

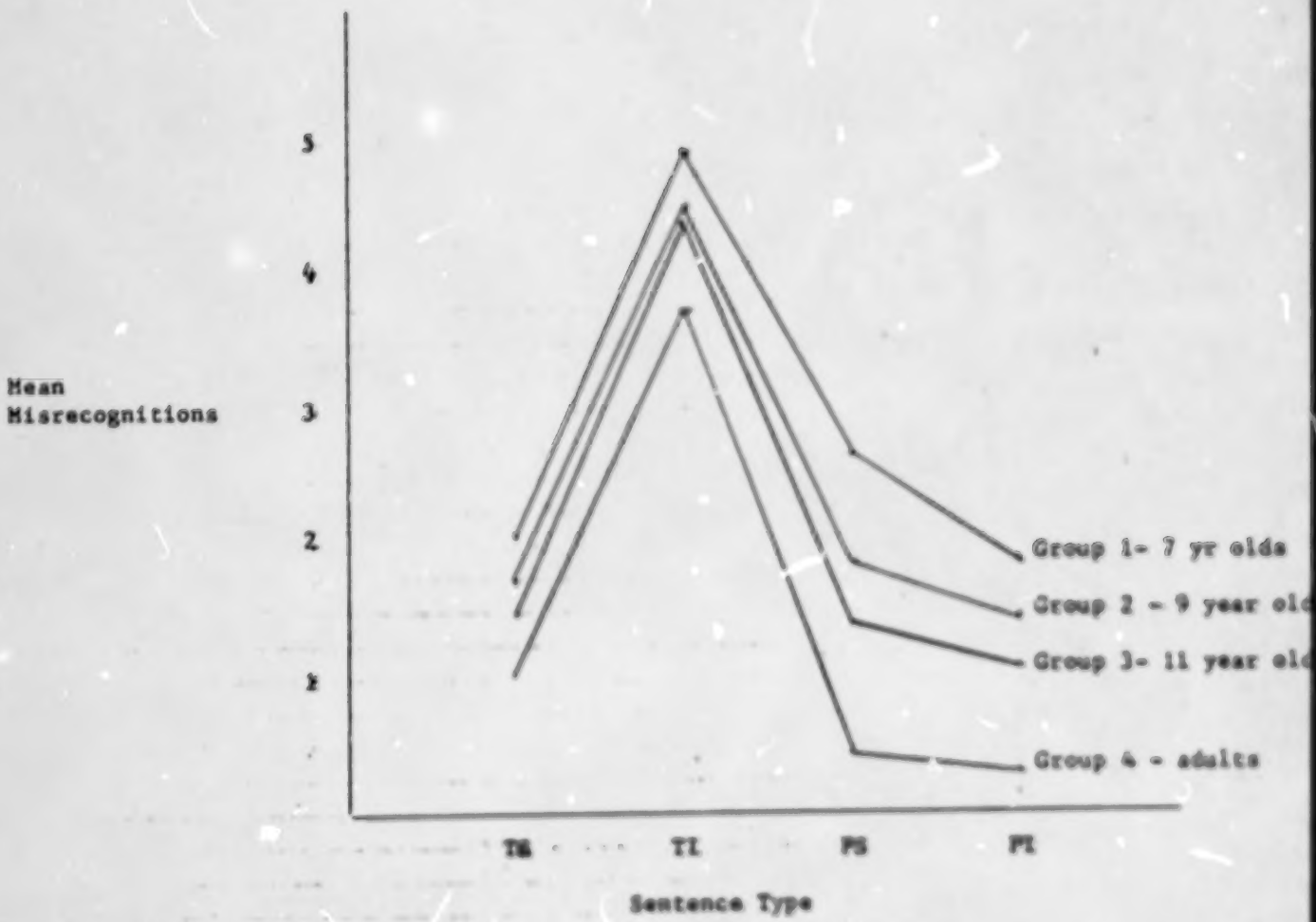

Figure 1

significantly more TI misrecognitions with the errors in the other categories similar in proportion.

The primary result, then, was the strong tendency for all subjects to "recognize" the semantically congruent inferences as having been present in the original paragraphs. This outcome does not seem to be attributable to generally poor memory for the stimulus sentences. Both the TI and FI had the same first and third term and were of similar length and syntactic construction. The only dimension of difference was the relational term, a subtle, semantic difference which retained the original syntax. If poor memory were the cause of error, one would not expect such a large error discrepancy between the true and false inferences (T_{149} = 18.1, $p < .001$).

Conclusions

Results of this experiment strongly support the constructive viewpoint of comprehension and the extension of this view to a characterization of children's silent reading comprehension. Comprehension and retention were primarily functions of the semantic descriptions embodied in the acquisition paragraphs rather than of the sum of the actual linguistic entities.

The data further suggest that even children in the early stages of reading acquisition, when confronted with a silent reading task, exhibit evidence of this active construction and retention of semantic information which spanned sentences in the discourse. While this in no way implies that lexical and syntactic factors are unimportant, it does suggest that investigations of reading comprehension and the difficulty involved should progress beyond such factors to questions of intersentential constructions.

Finally, these results support both research with adult subjects (Bransford et al, 1972) which emphasized the active role of the comprehender, and those done with children using auditory input (Paris and Carter, 1973). Most significantly, it provides support with silent reading data for a constructive conception of the reading process which has found empirical justification predominantly in miscue studies based on analyses of oral reading data.

Implications

From these general conclusions, one can draw implications for further research and for pedagogy as well as support for a theoretical position on children's reading. An obvious direction for further research should be towards a reconsideration of theories and questions of readability. Lexical and syntactical considerations of reading difficulty have resulted in certain preconceptions about the appropriate structure for initial reading material. In line with procedures of simplification which stress the elimination of embedded sentences, the simple declarative sentence with repetition of nominal elements rather than use of anaphoric references common to speech has predominated. For example, in a primer one would be more likely to find:

The man is big.
The man is fat.
The man is my daddy

rather than:

The big, fat man is my daddy.

Structures such as the former assume that comprehension, for the young learner, is facilitated by simple, separable presentation of elements.

Since, however, even the youngest subjects in this study were able to synthesize the types of sentences given in the acquisition paragraphs, and, indeed, seemed to do so naturally, perhaps such attempts at simplifying prose for reading acquisition work against the natural comprehension processes of the beginning reader. Some current work on this question (Hansell, 1976) seems to indicate that syntactical and lexical simplification of reading material in line with guidelines resulting from acceptable readability formulae does not foster improved comprehension by school-age subjects. Furthermore, the mismatch between such "simplified" style and the oral language of the readers has been a topic

of concern among educators for decades (Strickland, 1962) but with little observable change in primary materials. Currently, it is being suggested that further research on readability might be most productive if the development of children's semantic structures were to be used as a touchstone for analysis, a possible orientation for the future.

Yet another line of research might involve the type of constructive activity that readers of differing ages can/do exhibit. The data from this survey all revolve around locational and spatial constructs. A fruitful line of inquiry might be the study of whether other types of relational situations lend themselves to constructive use by the child reader. Work with adult subjects has indicated that subjects routinely infer instruments needed to carry out recorded events even when no instrument is mentioned explicitly as well as fillin-in causes and effects necessary to "make sense" of a text. Since the child's language structures continue to develop well into the middle grades (Chomsky, 1969), all types of "constructivity" exhibited by adults may not be possible for children at all stages of development. Such inquiry might result in sensible estimations of conceptual load when determining materials for developmental reading.

Though the possibilities for research stemming from investigations of this type are too numerous to catalogue or forsee, one might ask if, with so much to be known, any implications for pedagogy can be drawn from this and related data. Taking an affirmative stance, the strongest implication is support for the constructive view of the reading process which is currently being posed (Ryan and Semmel, 1969). Even in very young readers, a process of assimilating the read materials into existing knowledge

structures was evidenced. The reemphasis of reading as a language based process finds expression, therefore, not only in miscue analyses of oral reading data, but also from an investigation of silent reading situations. These data certainly militate against the view of the business of the primary instructional program as decoding only, concentrating on the sound/symbol relationships of the language. Further, although cognitively immature, the beginning readers in this study exhibited the same patterns of assimilating read material as did adult subjects. These results certainly call for more emphasis on comprehending what is read in the reading acquisition situation.

Both the stress on comprehension, the use of the reader's background of context into which the material is assimilated and the similarity of findings with read discourse to those with oral language comprehension suggest that approaches which begin with the reader's own language and experience might be most profitable for initial instruction. Thus, programs based on a "language-experience" approach might be most useful in porviding a structure in which the "filling-in" process would be facilitated for the child just beginning instruction.

The data from this and related experiments,, therefore, call for a new view of reading comprehension. The time for developing theories of comprehension and readability in isolation from the characteristics of the reader and the reading context is past. A primary experimenter in comprehension noted:

> People carry meanings, and linguistic inputs merely act as cues which people can use to recreate and modify their previous knowledge of the world.
>
> (Bransford and McCarrell,1974; p. 207)

This view is quite different from the perspective which views comprehension as a passive process of storing and retrieving linguistic entities which are "givens" within a text. Implicit in this more active view of comprehension is the belief that an adequate characterization of the process must take into account the changes within the mental schemata of the comprehender as well as the situational and contextual variables surrounding the comprehension act.

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